Alaska Statewide Digital Mapping Initiative

User Survey Report

Project Needs, User Preferences, and Potential Partnerships

www.alaskamapped.org

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ALASKA STATEWIDE DIGITAL MAPPING INITIATIVE PROJECT PLANNING

SDMI User Survey Report
Project Needs, User Preferences, and Potential Partnerships

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By HDR Alaska, Inc. and i-cubed information and integrating LLC

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EXECUTIVE SUMMARY

A survey and assessment of Alaska mapping user needs was conducted on behalf of the Alaska Statewide Digital Mapping Initiative (SDMI) by HDR Alaska and i-cubed, contractors for SDMI Project Planning. The findings and recommendations in this report represent the first of several components of SDMI Project Planning. The primary goals of the User Survey were to identify current and planned mapping projects and existing data that meet the goals of the SDMI program, assess funding options; and to document user preferences and requirements. Several conclusions can be drawn:

- The major user groups have similar needs and preferences. State, Federal, and non-governmental users both map similar features, namely hydrographic features, urban and rural infrastructure, and land management aspects. The use cases presented in this report are built upon responses from all of the user groups and indicate a common need and use for statewide digital mapping data.
- Frequent imagery refresh is important to users. Nearly half would like imagery data refreshed on a three year or better time cycle. .A periodic refresh of the statewide elevation layer is needed to improve its accuracy and increase its resolution.
- Survey respondents indicated significant interest in the SDMI program as a way to pool resources and establish a common mapping program. There is a strong willingness to engage in follow-up activities, and discuss ways to jointly fund mapping programs.
- Easy access to data and documentation (metadata) is important to users. One of the major impediments to digital basemap usage cited by respondents was easy access to low cost data. Fortunately, SDMI has already made significant improvements to data access though the program's data distribution efforts over the past two years.

The initial SDMI planning project task was to survey and interview users in order to clearly identify stakeholders, identify project needs, user preferences, and potential partnerships. The survey was conducted online and distributed to 320 mapping (GIS, survey, other) users statewide. Follow-up interviews and meetings were also used to get more information. We received 152 responses across a spectrum of user groups: state, federal, private firms, Native organizations, conservation groups. The dominant response was from State and Federal users, each at 48 and 40 responses respectively. The State response was from a wide variety of 12 departments and divisions, including for example the Department of Environmental Conservation, Department of Transportation, and others (See Section 1, Table 1 and 2). The survey results were used to develop use cases (see Section 1.2), and guide in development of an SDMI specification.

In summary, the results of the User Survey and associated activities can be summarized as follows:

- Mapping of dynamic features is a high demand need. Examples: coastal shorelines, stream and river banks, rural and urban roads, and other human-based infrastructure.
- Most respondents would like a refresh of 3 years for imagery, and much less frequently for elevation data. Reasons cited for this are the rapid change occurring both naturally and in the human environment in Alaska.
- Users want a readily accessible, one-stop source of statewide mapping data. At the present time, many use Google Earth and USGS topographic DRGs in lieu of this.
- Most respondents feel the existing Alaska USGS NED DEM is not satisfactory, but there is nothing else available.
- Most respondents would like to see a common repository established not only for statewide mapping data, but for control data as well.
- The predominant SDMI use cases are: land management, environmental analysis and mapping, land cover/vegetation mapping, transportation infrastructure mapping, and natural resource inventory mapping.

Recommendations

- SDMI should continue successful data distribution efforts and make ongoing improvements to provide low-barrier access to digital basemap data.
- SDMI stakeholder dialogue should be continued and strengthened, particularly to encourage State and Federal collaboration, and inclusion of other user groups, e.g. Native corporations and organizations, and key private firms.
- A specification for SDMI imagery and elevation data can be developed via use cases, and knowing what feature types the Alaska mapping community maps. The specification should be refined through subsequent SDMI project planning tasks, other forums such as the AGDC.
- SDMI User Needs and Use Cases should be further clarified. We recommend the following activities to do this:
    - Organize focus groups to clarify needs and priorities, and business drivers.
    - Further dialogue with survey respondents to better understand certain segments of users, and to better document use cases.
    - In general, conduct follow up activities, including meetings with the stakeholder and user groups in Fairbanks, Juneau and Anchorage, to present survey findings and solicit follow up input.
    - Contact survey respondents who were willing to share data. Identify existing data and control holdings and incorporate into SDMI data services.
    - Use key findings to help define a Request for Proposal scope of work with the SDMI Executive Committee.

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LIST OF ACRONYMS AND ABBREVIATIONS

AGDC	Alaska Geographic Data Committee
ANCSA	Alaska Native Claims Settlement Act
ADNR	Alaska Department of Natural Resources
AGPS	Airborne Global Positioning Systems
ASPRS	American Society of Photogrammetry and Remote Sensing
CBJ	City & Borough of Juneau
CORS	Continuously Operating Reference Stations
DCCED	Department of Commerce, Community and Economic Development
DEC	(Alaska) Department of Environmental Conservation
DEM	digital elevation model: a digital file consisting of terrain elevations for ground positions at regularly spaced horizontal intervals.
DF&G	(Alaska) Department of Fish and Game
DGGS	(Alaska) ADNR-Division of Geological and Geophysical Surveys
DGPS	Differential Global Positioning System
DOC	U.S. Department of Commerce
DMVA	Alaska Division of Military and Veterans Affairs
DOD	U.S. Department of Defense
DML&W	(Alaska) ADNR-Division of Mining Land and Water
DOG	(Alaska) ADNR-Division of Oil and Gas
DOT&PF	(Alaska) Department of Transportation and Public Facilities.
DRG	A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey (USGS) topographic map. The scanned image includes all map collar information. The image inside the map neatline is georeferenced to the surface of the Earth.
DTM	Based on a TIN of mass points and breaklines, A digital terrain model represents a terrain surface, and is typically used as input for the generation of surface models and contours or the orthorectification process of aerial photography
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FNSB	Fairbanks North Star Borough

GINA	Geographic Information Network of Alaska, part of UAF
GIS	Geographic Information System
GPS	Global Positioning System
GRS	ground receiving station, used to collect satellite data
IFTN	Imagery for the Nation, a pending federal initiative for ortho-imagery
KPB	Kenai Peninsula Borough
KGB	Ketchikan Gateway Borough
MOA	Municipality of Anchorage
NDGPS	Nationwide Differential Global Positioning System
NED	National Elevation Dataset
NOAA	National Oceanic and Atmospheric Administration
NSB	North Slope Borough
NSGIC	National States Geographic Information Council
NTSB	National Transportation Safety Board
OHMP	(Alaska) Office of Habitat Management and Permitting
SDMI	Statewide Digital Mapping Initiative
TIN	Triangular irregular network: elevation points networked to provide the basis for generating elevation surfaces
UAF	University of Alaska, Fairbanks
URISA	Urban Regional Information & Systems Association
USCG	U.S. Coast Guard
USDA	U.S.Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WAAS	Wide-Area Augmentation System

1.0 USER SURVEY, INTERVIEWS, & EXISTING DATA INVENTORY

Introduction

The initial SDMI planning project task is the first of seven project planning tasks; and its purpose was to survey and interview users in order to identify project needs, user preferences, and potential partnerships. These results were used to identify current and planned mapping projects and existing data that meet the goals of the SDMI program and to perform an initial inventory of existing digital data held by respondents.

Task 1 began with three key activities done in conjunction with the SDMI management team:

- Planning and stakeholder meetings to launch the project
- Identifying SDMI stakeholder list for survey
- Developing the user survey and implementing it.

After the survey was closed we followed up with:

- Capturing area of interest through shapefile submission or input into an online map tool
- Interviewing of key users to get more information.
- Developing use cases and profiles, and
- Completing the documentation of an inventory of existing basemap data sources held by respondents.

The results of the survey are summarized in this report in the Appendices, and in the following six ancillary digital documents. We will only publish Appendices 4.1—4.6, as 4.7 and 4.8 contain contact information that respondents may not want distributed. *Note, the spreadsheets give one a better ability to search and peruse the data.*

- SurveySummary_20080513.pdf - Summary detail (with graphics, reports of survey responses)
- sdmi_Profile _and_User Needs.xls - Filtered analysis of the responses
- sdmi_User Comments & Open Responses_v2.xls - Graphical presentations of the survey responses
- sdmi_Full Respondent List_v2.xls - List of survey respondents
- Task1_Existing_Image_Inventory_20080520.xls—Summary of the existing imagery data inventory work
- Task1_Existing_Terrain_Inventory_20080520a.xls - Summary of the existing terrain data inventory work

1.1 User Survey

1.1.1 Survey Design & Methodology

Survey Design

The SDMI survey drew from the experience of prior survey efforts: The USGS and ASPRS surveys were related to Landsat use and requirements; and an Imagery For The Nation (IFTN) survey sought to characterize general imagery uses and needs nationwide. The USGS, ASPRS, and IFTN surveys provided a starting point and model for the SDMI survey. Additionally, local AGDC survey efforts mostly in the form of meeting forums provided a starting point for development of specifications. Appropriate elements from all of these efforts were selected and modified to meet Alaska SDMI needs.

Online Survey

The SurveyMonkey (www.surveymonkey.com) tool was used to collect responses, view summary reports, and then download the responses in database format. The construction of the survey was done in-house at HDR Alaska, and reviewed externally by USGS in Fort Collins, CO. A test group of key individuals was formed to review how the survey performed online as well as provide feedback on the questions. This group consisted of a cross section of users including private consultants, state, federal, and local agencies.[1] The survey was activated and distributed to the user group starting on February 25, 2008 and closed on April 8, 2008. Once the survey was closed, additional reports were generated from the downloaded database. Results of this analysis are summarized in Appendix 4.2.. A complete list of survey questions and the overall responses for each is shown in Appendix 4.1.

Stakeholder Definition & List Generation

The pool of 320 users/stakeholders was generated from mailing lists for the Alaska Geographic Data Committee, Anchorage Arc User Group, and Alaska Surveying and Mapping Conference registrants. Additional names were suggested by SDMI staff and contractors and included in the distribution. During the survey analysis phase, the respondents were grouped into user profile groups based upon affiliation information provided as part of the survey. We made a strong effort in this project to collect responses from key agencies and organizations that would have a mapping need. A starting point in that definition was to look at user groups by the amount of land they manage or own. Figure 1 below depicts the breakout of these major user groups. For this survey we received input from these groups, as well as area

[1] Thanks to Ted Cox, SCS, Gerald Minick, BLM; Chris Noyles, BLM; Tom Duncan, FNSB; Bill Holloway, KPB; George Plumley, DCCED; John Koltun, GRS; Hans Anderson, USFS; Rick Guritz, UAF; AC Brown, USGS; Caroline Hermans, USGS; Steve Colligan, eTerra.

of interests (AOI) for most of them (see Appendix 4.3 for a list of the AOI respondents).

Figure 1. Alaska Land Ownership (BLM source)

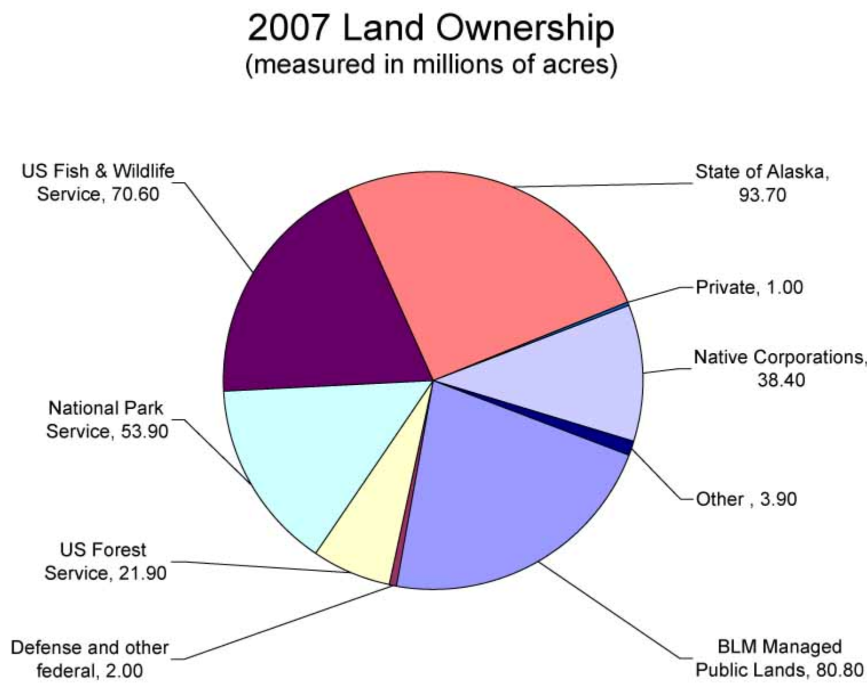
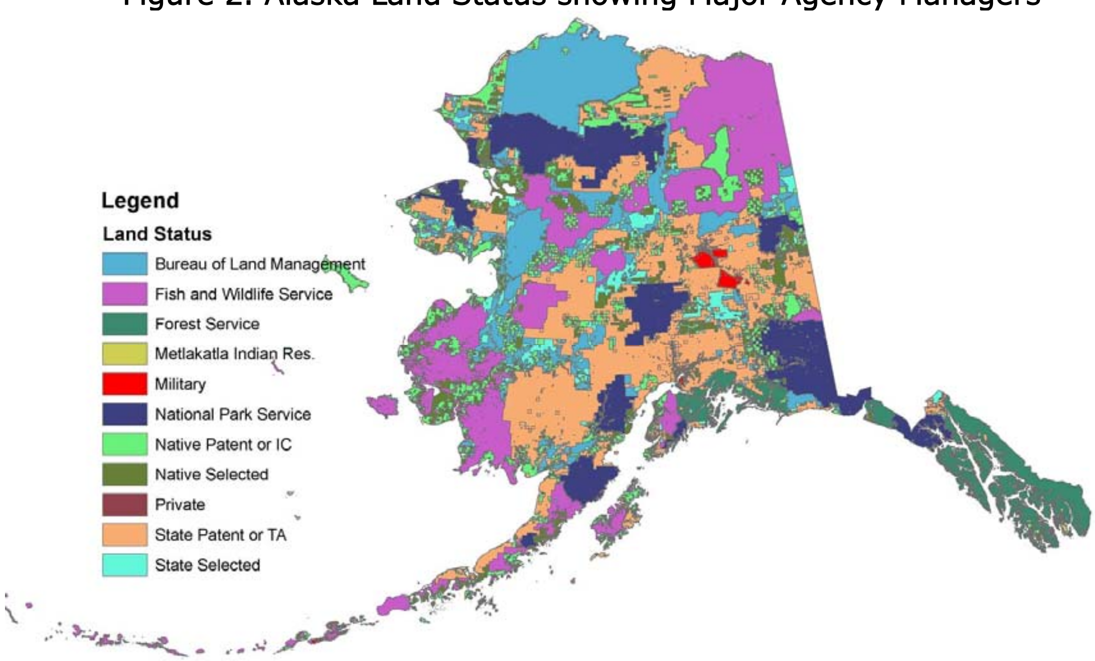


Figure 2. Alaska Land Status showing Major Agency Managers



Survey Response

A total of 152 responses were received from the 320 users contacted and asked to complete the SDMI Survey. This is an excellent response rate from an online survey. The IFTN national survey by comparison averaged 38 respondents per state.. A broad cross-section of users responded: state agencies (35%), federal agencies (25%), the private sector (17%), local government (8%), academia (4%), utilities (3%), military (3%), not-for-profit (2%), not-for-profit Native corporations (1%), and other (2%).

Table 1. Summary of Responses by User Group.

Agency	Response Count
State	48
Federal	40
Private Firms	30
Utilities	5
Local Government	11
Native Corporations	5
Not-for-profit	5
University	8
TOTAL	152

Table 2. Summary of Responses by Agencies

STATE	
DEC	4
DF&G	8
DMVA	1
DNR Carto	9
DNR DGGS	2
DNR DMLW	6
DNR-DOF	6
DNR-DOG	3
DNR-OHMP	1
DNR-Parks	1
DOT&PF	5
DCCED	2
SUBTOTAL	48
FEDERAL	
BLM	6
USFS	12
USFWS	1
NPS	6
NOAA	2
USAF	2
US ARMY	3
NATL GUARD	2
USGS	5
NRCS	1
SUBTOTAL	40

1.1.2 Survey Results

User Profile

One objective of the survey is to identify Alaska stakeholder preferences and requirements. The analysis of these preferences from the survey results is in the Profile Groups Table (see Appendix 4.6, and in spreadsheet form: "sdmi_Profile_and_User Needs.xls"). The results were filtered by respondents' answers to the profile question, in which they were asked to select a user group that best matches their profile. The results presented are separated into Profile Groups which can be used as a tool for understanding the needs of basemap users falling within a shared profile. We found that the Survey response correlates well with land ownership in Alaska; for example, the highest response groups to the Survey in terms of agencies was from State of Alaska agencies, BLM, and NPS. A strong group of private industry respondents provided us with good information. This particular response is weighted highly as many of the private sector respondents, for example GIS and mapping consultants work for, and represent, major land owners or operators in the state. For example, firms such as Resource Data, Inc., eTerra, ABR, HDR, and Blue Skies do a large portion of mapping for Native corporations, mining companies, oil and gas companies, etc. Although we did not get much response directly from mining and oil and gas companies, we did get strong response from the State mining and oil and gas divisions, and again from consulting firms doing work for these organizations.

Scope of Response:

- my own views 68%
- organizational view 32 %

Respondent profile

Manager or Technical (mostly technical)

- Manager 12 %
- Technician 33 %
- Both 45 %
- No response 8 %

Organizational profile

The Survey received input from users across a broad spectrum of governmental, private, Native, academic, and not-for-profit organizations. The results of the survey in this regard are summarized below in Figure 3, and in Tables 3,4,5.

Figure 3. SDMI Survey Respondent Broad User Groups

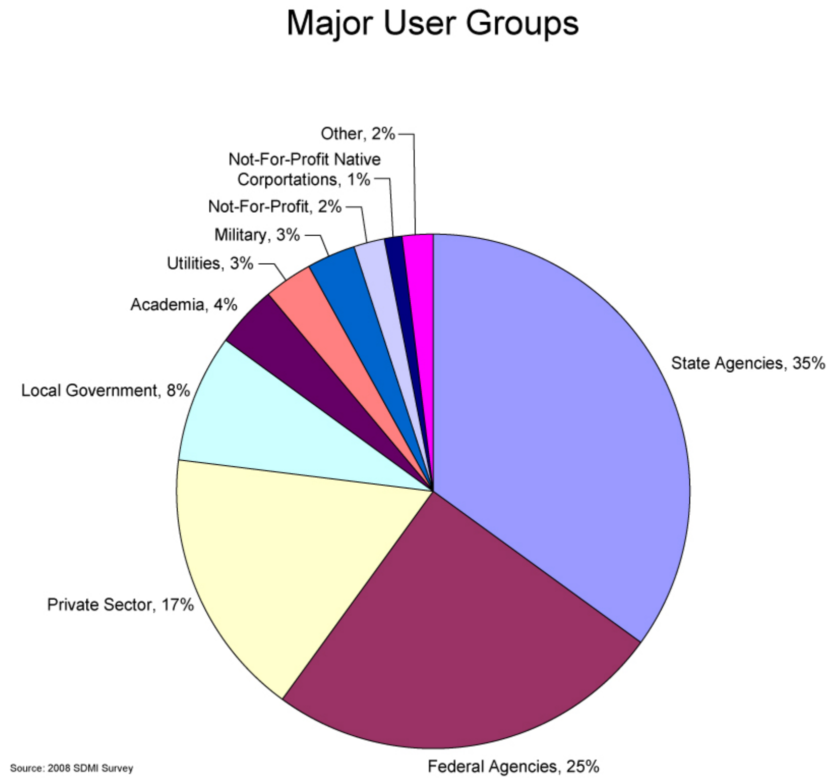


Table 3. Group 1 Users

Function	Response %
Land Management	60.7
Environmental analysis and mapping	58.7
GIS and related consulting	52.7
Land Cover Mapping (wetlands, vegetation mapping)	48.0
Earth sciences: mapping, research	42.0
Water Resources Management	35.3
Transportation & Infrastructure development and planning	35.3
Cadastral / Land Records	30.7

Table 4. Group 2 Users

Function	Response %
Engineering (multidisciplinary)	29.3
Regional planning	27.3
Coastal & Ocean mapping	26.0
Climate change/Detection	26.0

Forestry management	24.0
Fisheries management	23.3
Emergency Response & other Public Safety	23.3
Surveying	22.7
Urban (city, other) planning	22.7
Disaster planning	22.7
Fire Hazard Planning & Wildfire Response	21.3
Preliminary engineering	20.7
Property Appraisal / Real Estate	20.0%

Table 5. Group 3 Users

Function	Response %
Energy (oil, gas, other)exploration	19.3
Energy (oil, gas, other)development	18.0
Mining exploration	18.0
Design & Survey	16.7
Academia/ Research	16.0
Aviation Safety	14.7
Mining development	13.3
Other	12.7

Scope of Operations

The majority of respondents operate statewide at 42 percent, followed closely by Southcentral at 34 percent, with Interior, Southeast, and North Slope each at about 16 percent.

Table 6. Respondents areas of operations

Response	Response %	Response Count
All of the above - Statewide	42.0	63
Southcentral	34.7	52
Interior	18.0	27
Southeast	16.0	24
North Slope	15.3	23
Southwest	12.0	18
Northwest	10.0	15
Aleutians	4.7	7
Bering Sea	4.0	6

Economic

Expenditures on digital basemap data:

- Most respondents did not comment on this question - 80%.
- >$500,000, 3 responses (2%)
- $5,000—$100,000, 27 responses (18%)

Partnering

- 30 respondents were interested in partnering
- 90 respondents answered maybe –, conditions not provided
- 20 said no interest in partnering
- 12 said "no authority"

Availability

Mapping Sources used when public sources of digital imagery and elevation data are not available:

1) Google Earth: used heavily by Survey Respondents (96 respondents) as source for statewide digital mapping.
2) USGS Topographic Maps (DRG) USGS topographic maps (DRG, other). Still heavily used by all user groups (120 respondents) for statewide mapping despite known inaccuracies.

Figure 4. Google Earth

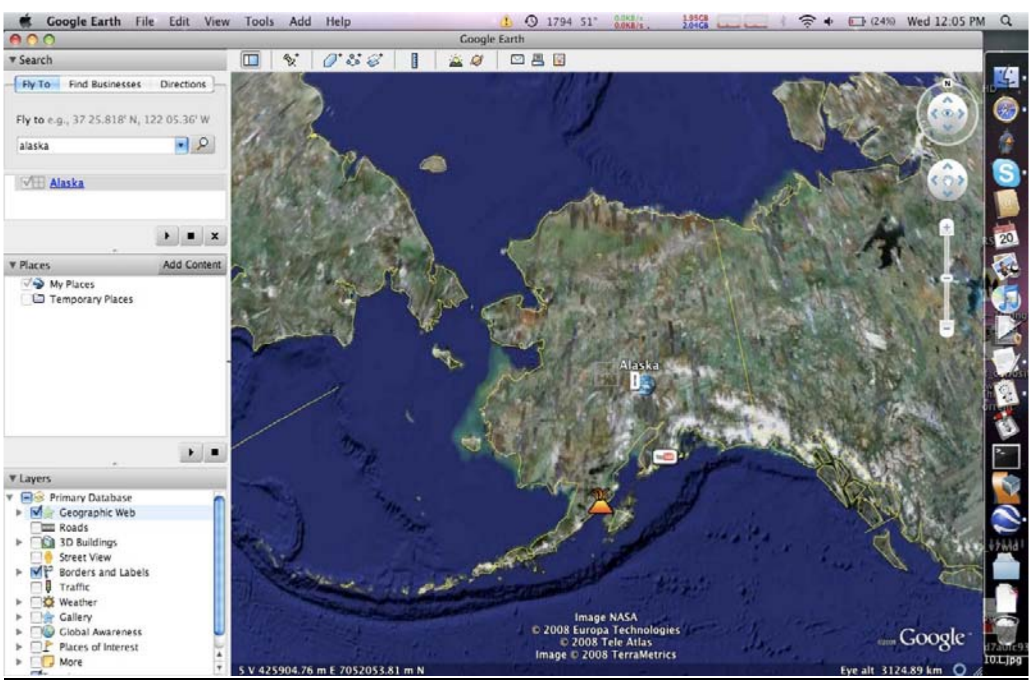
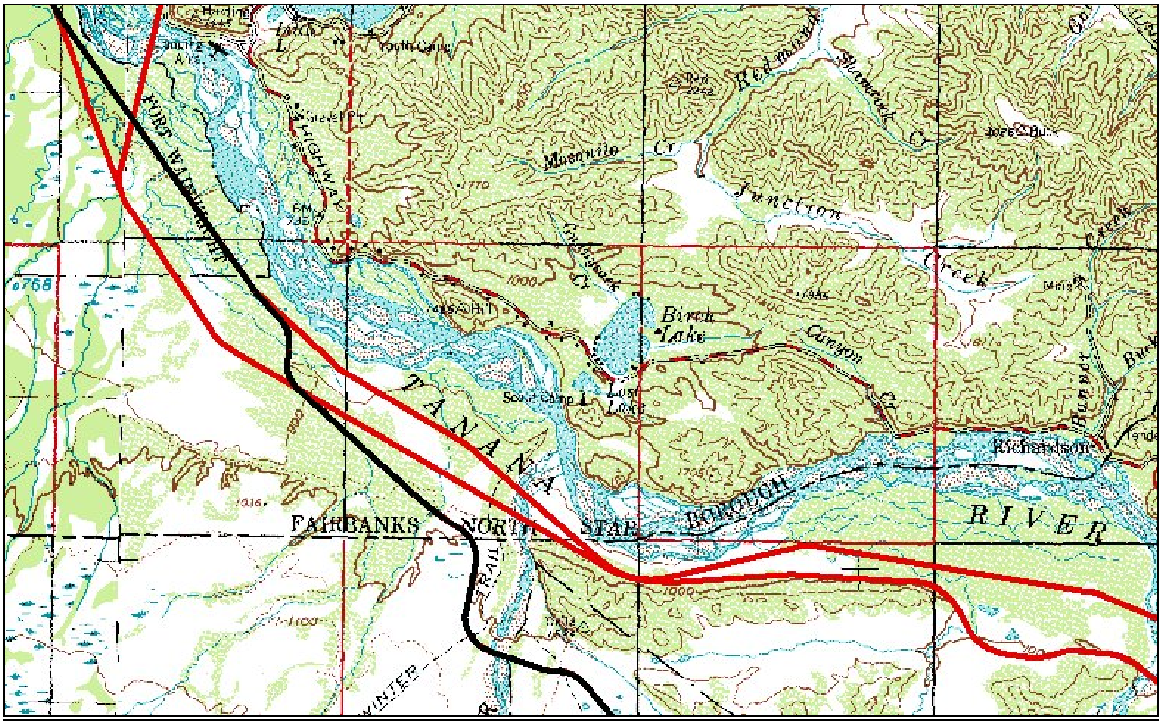


Figure 5. USGS Basemap Example: used in planning for rail project near Fairbanks.



Other types of digital basemap data being used

Digital Elevation data

The following digital elevation data types are used (listed in order of frequency)

- USGS NED
- USGS DEMs at larger scales where they can get them
- LIDAR
- Photogrammetric DTMs

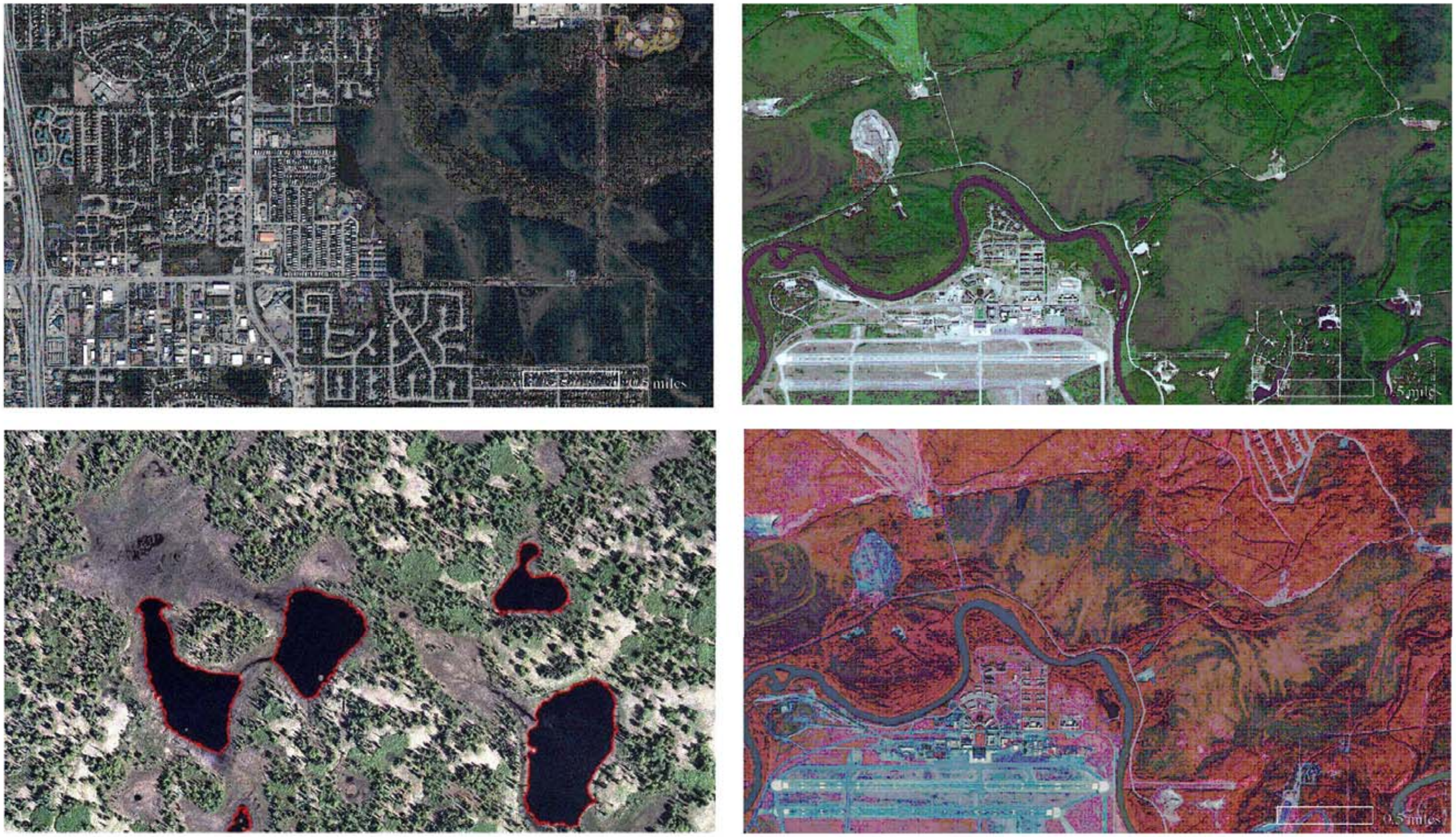


Figure 6. Other digital imagery used: from upper left: Quickbird .6m (Anchorage), Orthoimagery 2 ft.pixel (southcentral Alaska), SPOT 2.5m (Fairbanks), 1986 U2 CIR, 1:60000 (Fairbanks—same area as SPOT image)

Does existing data meet your needs?

- Sometimes 87%
- Always 4%
- Never 8.5%

Table 7. Impediments to using basemap data

Impediments	Response %	Response Count
Cost	67.10	98
Difficult to get the data or use it	32.20	47
Lack of tools or knowledge in using digital data	14.40	21
Available options from vendors are confusing to me	8.90	13
Lack of available data	61.60	90
Available data is of poor quality	50.70	74
File sizes are too large to work with	10.30	15
All of the above	13.00	19
Other	6.20	9

Impediments and obstacles to obtaining basemap data

- 67% agree cost is a major impediment to using digital basemap data.
- 61% agree that there is a lack of available data.
- 32% agree digital basemap data is difficult to acquire and use

Most would use basemap data daily if the data were available, and in a close second use it weekly.

122 respondents said they would prefer to see ground control points made available in a repository. Photo identifiable control is a common request. Very specific geodetic concerns regarding items such as tidal gauge networks and geoid concerns were expressed.

Most respondents would prefer data be available in full resolution, but close second said they would like the data made available via the Web (web mapping service). Web mapping services are new concept to many users and their adoption and growth is on the rise.

Most respondents said that ortho-imagery and elevation data would allow them to use GIS and other tools more effectively; and this would enhance their mapping programs.

Preferences

Resolution and accuracy are two important issues. Rather than query respondents in terms of resolution scales, the question was put to them in terms of types of areas they want to map, and features they want to map. Acquisition areas were asked in terms of Alaska regions, and a separate effort is underway to get areas from respondents who offered shape files. Imagery and elevation data were treated as separate in the survey. Rather than ask respondents to pick one or the other as a priority, we chose to ask questions regarding use and solicit how this data is used. Finally, frequency of acquisition or refresh is another critical aspect of SDMI, and is summarized below.

Summary of Features Mapped By Users (All Users)

- <u>Hydrography</u> (moderate control)
  - River banks
  - Water bodies
- <u>Land cover features</u> (moderate to high control)
  - Forest stands
  - Wetland areas
- <u>Urban features</u> (typically ortho-rectified)
  - Roads
  - Buildings
  - More discrete: hydrants, etc.
- <u>Rural features (moderate control)</u>
  - Roads
  - Buildings

<u>Resolution</u>

Users were asked what feature types they map, and the most commonly mapped are summarized below. Greater than two-thirds of the respondents are mapping hydrographic features, and approximately 46 to 49 percent are mapping road features. Utilities are a major feature being mapped as well, with approximately 30 percent of the respondents having a utility type component. Many of the most commonly mapped features described in Table 3 below are dynamic in nature, that is they change within relatively short timeframes. For example, hydrographic features such as stream banks, coastal margins, wetland boundaries, and roads can substantially change within a two to five year period.

Table 8. Response regarding desired characteristics of digital imagery and elevation data

Criteria	Highest priority %	Moderate priority %
Spatial resolution	91	47
Having a georeferenced base (absolute accuracy)	89	44
Data has metadata or is documented well	78	44
Ease of use	50	60
Frequent (e.g.annual) acquisition of data	26	61
Interoperability	25	75
Existence of archive of older imagery	17	61

Table 9. Features most commonly mapped by respondents

Response:	Response %	Response Count
Hydrographic features (discrete, e.g. river banks, ponds, discrete coastlines, etc.)	75.2	106
General hydrographic features (e.g. broad outlines of rivers, coastline)	55.3	78
Vegetation, landcover, e.g. forest stands	53.2	75
Parcel/property boundaries	51.8	73
Wetland boundaries (discrete, e.g. ¼ acre per COE, EPA)	50.4	71
Major roads & intersections	48.9	69
General wetlands	47.5	67
Road center lines	46.1	65
Houses and building footprints	34.8	49
Geologic (e.g. unit mapping)	31.9	45
Utilities e.g. hydrants, electric power pole	31.2	44
Pipelines	30.5	43
Tree canopies	27.0	38
Mining	26.2	37
Commercial buildings	24.8	35
Parking lots/impervious surface	24.1	34
Agricultural	10.6	15
Pivot irrigation	2.8	4

Elevation Resolution

This was asked two ways: a) in terms of topographic contour interval, and b) in terms of DEM. The reason for this is that many people are more familiar with topographic data expressed as topographic contours. See Appendix 4.2 (spreadsheet "profile and user needs") for detail on how user groups compare with topographic data preferences. The responses are summarized below:

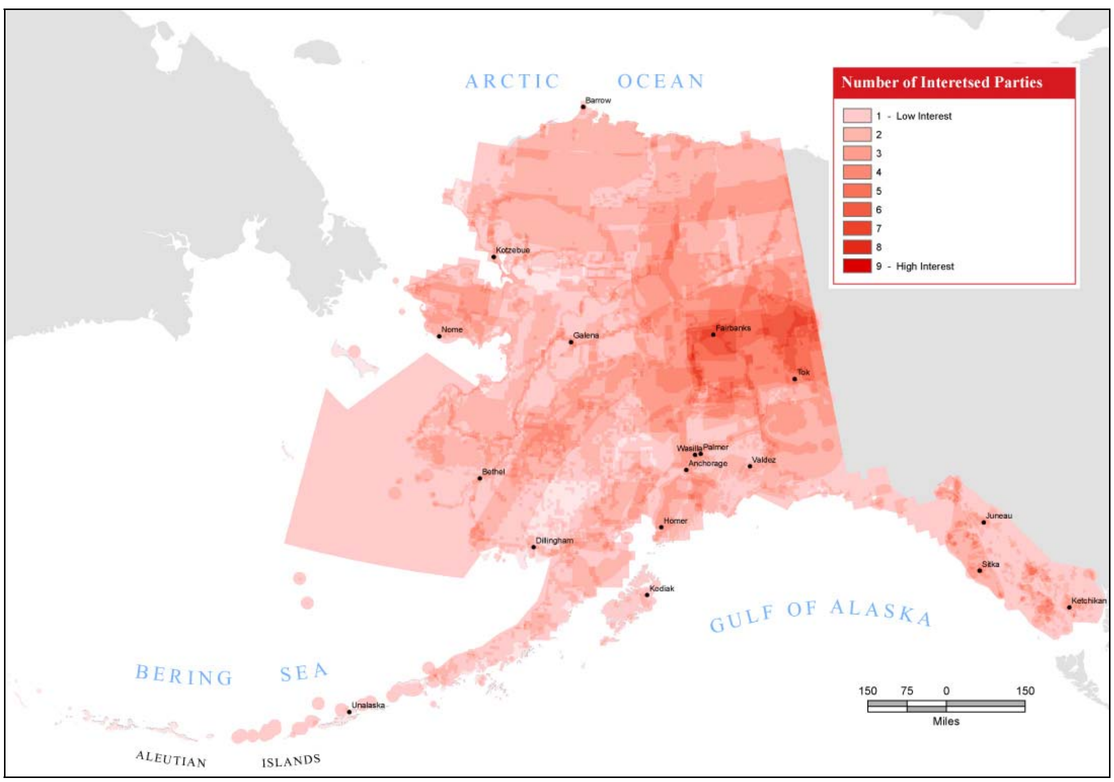
Table 10. Topographic Contour intervals most commonly requested

Topographic Contour Interval	Response %	Response
10 ft. contours (High-gradient terrain, low unit cost earthwork excavation estimates)	25.5	36
2 ft. contours (typically Route location, preliminary alignment and design)	22.7	32
20--30 ft. contours (typical moderate resolution USGS topographic maps, geologic/exploration mapping, etc.)	20.6	29
4 ft. contours (typically urban planning, preliminary project planning, hydraulic sections, rough earthwork estimates)	18.4	26
>50 ft. contours	1.4	2
30-50 ft. contours	0.0	0

<u>Areas of Interest digital imagery and elevation data</u>

As a follow-up activity to the survey we received area of interests (AOIs) from respondents via shape file; and through a DataDoors® application setup by i-cubed. A list of these AOI respondents is shown in Appendix 4.3. AOIs generated through the AGDC effort in 2005 were incorporated in this map. The AOIs were analyzed in GIS (using a simple grid additive overlay) to determine overlapping respondents areas of interest. Figure 7 below illustrates the results of this analysis. Darker red color shades indicates the most requested areas.

Figure 7. Acquisition areas for digital basemap data



We also requested specific areas of interest, for example economic corridors, villages, coastal areas, etc. As shown below in Table 6, the top three area types preferred by respondents are villages, river corridors, and villages.

in terms of Alaska regions, Table 11 below shows area type preferences. Table 12 depicts user's interest in the various regions of Alaska (shown in map in Figure 8).

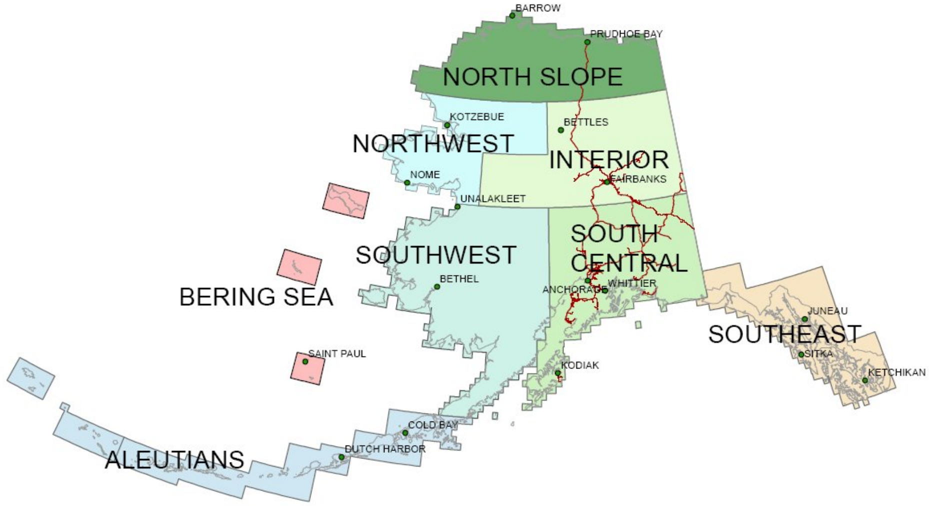
Table 11. Acquisition area preferred by area type (corridors, populated places, environmental areas, land management)

Area Type	Response %
All of the types listed below	46.8
River corridors	29.1
Villages	29.1
Highway corridors (e.g. Parks highway, etc.)	27.0
Urban areas (i.e. cities)	26.2
Environmentally sensitive areas, e.g. wetland, floodplains, habitat zones	24.8
Coastal areas	24.8
Economic corridors (e.g. pipeline route, mine access road, etc.)	21.3
Conservation management areas, e.g. parks, refuges,national monuments, etc.	14.2
Land management areas, e.g. Native corporate regions, National Petroleum Reserve Alaska, etc.	14.2
Forest management areas	10.6

Table 12. Acquisition Areas Classified By Alaska Regions

Region	Response %	Responses
Statewide	38.00	46
Southcentral	33.90	41
Interior	22.30	27
North Slope	16.50	20
Southeast	16.50	20
Southwest	10.70	13
Northwest	7.40	9
Aleutians	3.30	4
Bering Sea	3.30	4

Figure 8. Alaska regions (based on USGS, other sources)



Frequency/Repeat/Refresh of Imagery and Elevation Data

The imagery refresh rate requested by respondents fell clearly in the 3—5 year cycle, elevation refresh rate was 10 years. However, more clarification and follow up should be conducted with survey respondents regarding elevation data resolutions and refresh. AS shown in Table 15 the refresh rate varies by user group.

Table 13. Imagery Refresh Rates Requested

Frequency	Response %
Annually	18.4
Every three years	27.7
Every five years	24.8
At least every five to ten years	12.1

Table 14. Elevation Refresh Rates Requested

Frequency	Response %
5 years	17.0%
10 years	37.6%
15 years	18.4%
20 years	21.3%
50 years	1.4%
Other	4.3%

Table 15. Refresh Rates by User Group

Native	Every three years	50.00%
	Every five years	25.00%
Federal	Every three years	50.00%
	Every five years	25.00%
State	Every three years	32.70%
	Annually	20.40%
Local	Every three years	41.70%
	Every five years	25.00%
Private	Every three years	28.00%
	Every five years	28.00%
Military	Annually	50.00%
	Every five years	25.00%
Utility	Annually	60.00%
	Every three years	40.00%
Academic	Annually	33.30%
	Every three years	16.70%
Non-Profit	Every three years	66.70%
Cumulative	Every three years	27.70%
	Every five years	24.80%

Reasons for refresh of imagery and elevation

Reasons for data refresh were expressed by respondents as follows:

- Land features as mapped are dynamic oriented, that is they change over relatively short timeframes (in human terms). Hydrographic features such as stream banks are constantly changing; roads are being added and modified, etc.
- Ability to respond to new events is important: eg. Fire, flood, and earthquake response management
- Most respondents (70%) want a minimum five year refresh rate on imagery; 46% favor refresh of three years or better.
- A refresh of the current statewide elevation layer is needed to improve its accuracy and increase its utility for the primary uses, building ortho-images and supporting the state's aviation safety program.

Additional Information

In this part of the survey, most respondents said are willing to participate in follow-up interviews, and further discussion about SDMI.

1.2 Use Cases

Use cases are identified through a holistic analysis of the survey results[2]. Use cases represent the categories of use, and scenarios of use of mapping data statewide. Six primary Use Cases are identified using the results of the SDMI User Survey. In summary, the following primary use cases are based upon: a) types of features mapped by users, and b) user applications.

- Land Management
- Environmental Analysis & Mapping
- Land Cover Mapping
- GIS Consulting
- Natural Resource Inventories & Mapping
- Transportation infrastructure

Table 16 below summarizes the Use Cases for all users responding the to the SDMI User Survey. Figures 9, 10, 11, 12, and 13 below are examples of how imagery is used in the primary use cases.

Table 16. Use Cases—All Users

Use Case	Application (from Survey)	Most common Features Mapped (see Table 9)	Use Cas e	Respons e
Land Management	Land Management Includes cadastral mapping and land records	Parcel boundaries, administrative boundaries		63.50%
Environmental analysis and mapping	Environmental analysis and mapping	Hydrography, Other environmental features		44.20%
Land Cover Mapping	Land Cover Mapping (wetlands, vegetation mapping)	Vegetation: Wetlands; tree canopies; remote sensing derived features		36.50%
GIS and related consulting	GIS and related consulting	Wide variety of applications including land management, environmental, land cover,		32.70%

[2] *Definition: A use case provides scenarios of use, organizes functional requirements of the user, and models the goals of the system and user.*

		transportation	
Natural Resource Inventories	Earth sciences mapping, Forestry, Mining	Forest stands, geologic units, land cover units	28.80%
Transportation & Infrastructure development and planning	Transportation & Infrastructure development and planning	Roads, parking lots and impervious surfaces, buildings; utilities; pipelines	28.80%

Table 17. Federal agencies user group: use of data

Environmental analysis and mapping	62.20%
Land Management	59.50%
GIS and related consulting	56.80%
Land Cover Mapping (wetlands, vegetation mapping)	56.80%
Earth sciences: mapping, research	51.40%
Climate change/Detection	48.60%
Forestry management	43.20%
Water Resources Management	40.50%
Fisheries management	37.80%
Cadastral / Land Records	35.10%
Coastal & Ocean mapping	35.10%
Emergency Response & other Public Safety	29.70%
Fire Hazard Planning & Wildfire Response	29.70%
Transportation & Infrastructure development and planning	24.30%
Surveying	21.60%
Regional planning	21.60%
Disaster planning	21.60%
Academic Research	21.60%

Figure 9. Land Management Example: southwest Alaska, orthoimagery mosaic overlaid with land management boundaries and USGS township-section grid.

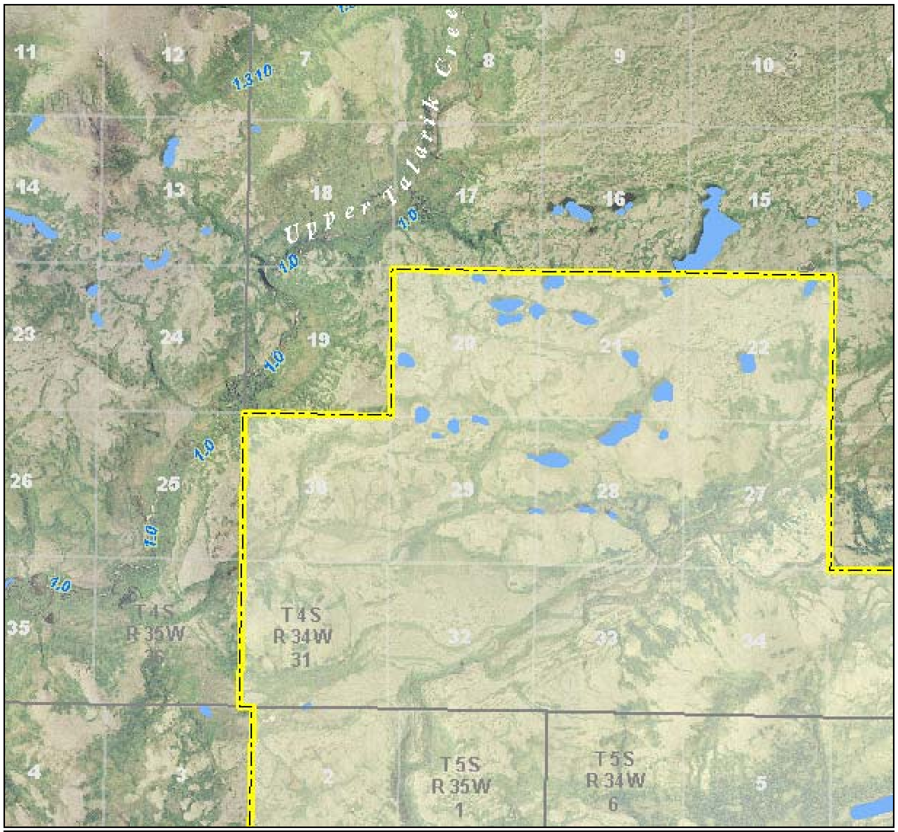


Figure 10. Landcover-Wetlands Mapping Example: Delineating wetlands (waterbodies delineated in red outlines) using high resolution orthoimagery.

Figure 11. Rural Roads Mapping Example: small community in Alaska roads mapping using best available imagery (Community Profiles imagery and GINA imagery).

Figure 12. Environmental Analysis & Mapping Example: fisheries analysis sites on streams, portrayed here on 1980's CIR imagery base.

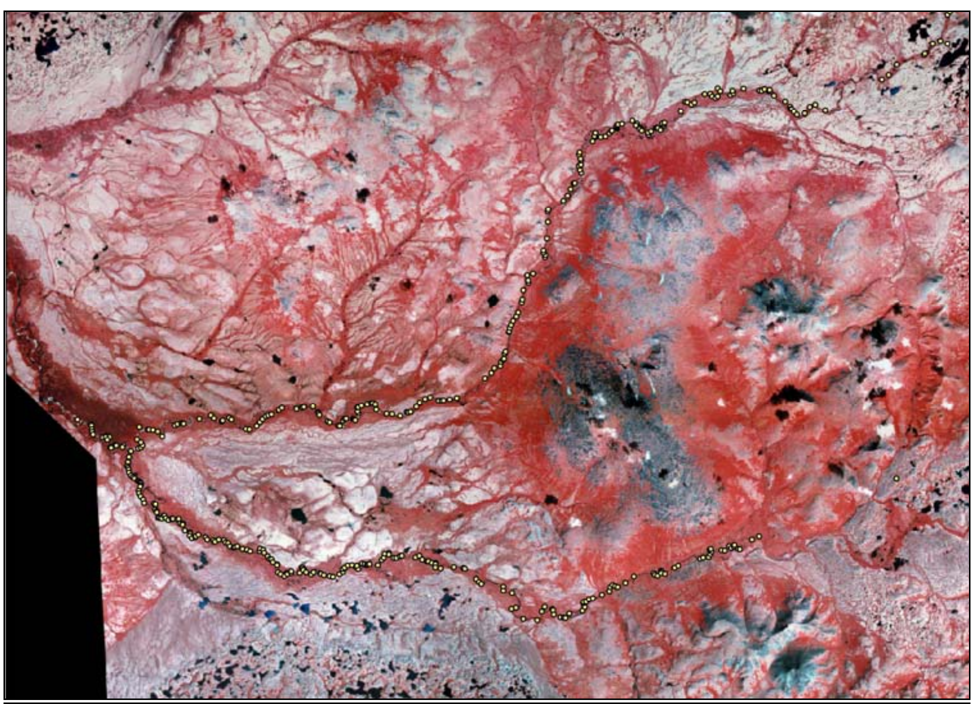
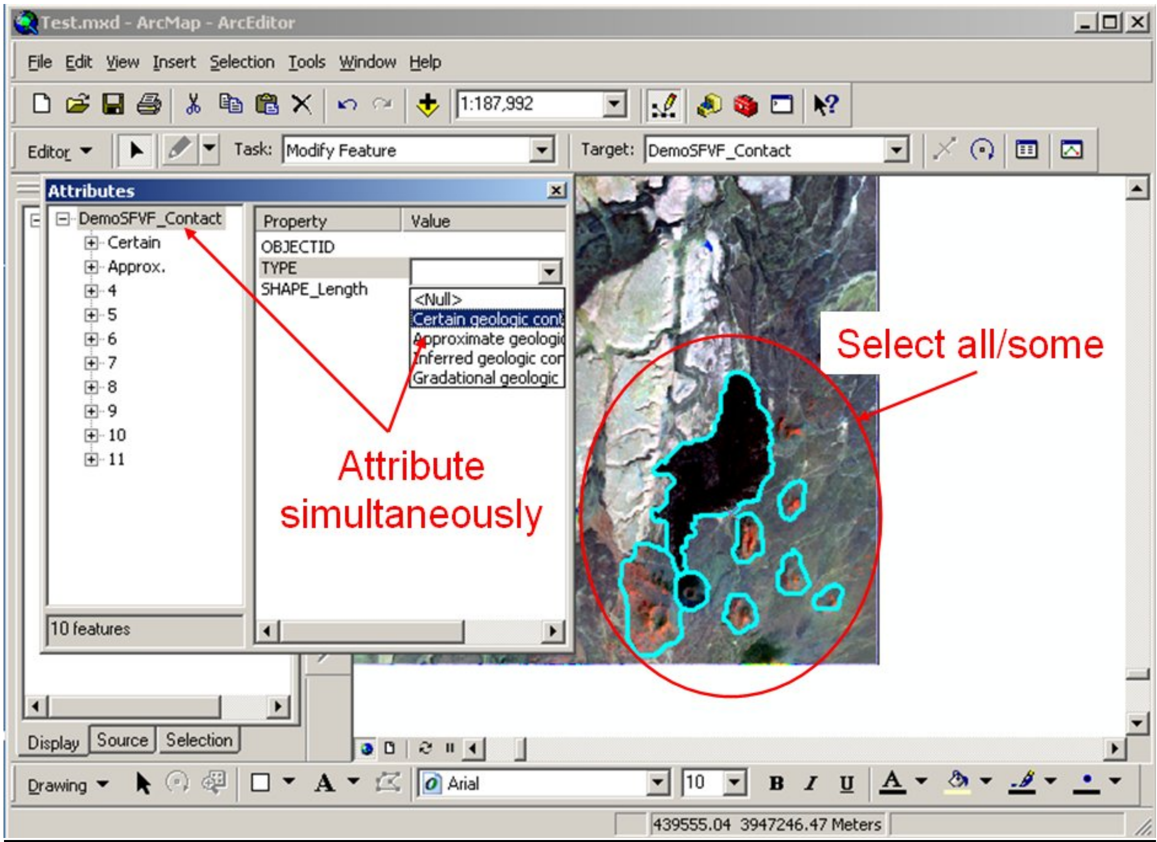


Figure 13. Natural Resource Inventories Example: geologic mapping with satellite imagery base, being digitized and attributed using GIS.



Functional Uses of digital base map data

Three main functional user groups broken out by functional uses of digital imagery and elevation data (using 30%, 20%, and 10% as thresholds) in order of highest response to the question: "what is your main use for digital imagery and elevation data?": Land management and environmental analysis and mapping are outstanding functional uses of digital basemap data, followed closely by earth sciences mapping and research.

Table 18. Use level, and form of usage of digital imagery and elevation

Use Level	Response %
Basic mapping (simple basemap, navigation, other)	88.7
Advanced mapping (analysis, other)	72.7
Visualization (3D, other)	55.3
Remote sensing	42.0
Surveying	18.0
Design (in CAD, other)	16.0
N/A	3.3

Table 19. Actual usage of (existing) digital basemap data

Actual usage of digital basemap data	Percent %
All of the uses listed below	53.3
I use already processed data or product, and derive another value added product from it	14.7
Primary, critical data set used for mapping, feature identification, or assessment.	12.0
A graphical background used to present information	8.0
Vicinity area data used to co-register or co-locate other geo-referenced data and information	5.3
I process the raw data into higher level products	4.0
Supplemental data or information supporting more primary sources of data and information	2.7

1.3 Funding Options

Many survey respondents felt they weren't authorized to express how much is spent on digital basemap data by their agency. However, of the response that did, two percent plan on spending more than $500,000 on digital basemap data, and 20% plan on spending $20,000 to $500,000. There are other expenditures for digital basemap data that weren't uncovered in the survey. These expenditures produce data that may be available for incorporation into the SDMI data archive and services.

Table 20. Respondents and Spending Levels Top Potential Funding Partners

Major expenditures on imagery			
Name	Title	Organization	Amount
Patricia D Miller	Design Group Chief	DOT&PF	>500,000
Ryan Anderson	Engineering Manager	DOT&PF	>500,000
Joni Piercy	GIS Team Manager	National Park Service	100-500,000
Steve Colligan	President	E-Terra, LLC	100-500,000
Joe Calderwood	Geospatial Group Leader	USDA Forest Service	100-500,000
Greg Barrett	Statewide GIS Coordinator	BLM	100-500,000
Garth Olson	Deputy State Director for Geographic Sciences	Bureau of Land Management	<500,000
Matt Nolan	Professor	UAF	<500,000

1.4 Public Review & Comments

The first major stakeholder event focused on the SDMI project took place at the AGDC meeting in October 2007. At this meeting 40 AGDC members were present. SDMI staff and contractors made presentations regarding the program and introduced the upcoming survey. *A unanimous endorsement of the SDMI project by the AGDC was received at the end of the meeting*.

At the 2008 Alaska Surveying and Mapping Conference on February 25-28, 2008, a number of SDMI activities were performed to inform and collect feedback from the public and stakeholders. SDMI staff and contractors manned the SDMI booth during the conference, collecting surveys, demonstrating web services available from SDMI, and answering questions about the project. On February 28, a morning session was dedicated to SDMI. SDMI staff, contractors, and data users (NRCS, USFS, NPS, USGS, and BLM) presented program information and applications. This meeting was very well attended by private vendors, agencies, and public. In the afternoon, at the AGDC general membership meeting, SDMI hosted a session titled "The Role of Vendors in Statewide Mapping". The session consisted of a series of vendor presentations regarding technologies and expertise.

Additionally, comments were collected through the survey. These comments are summarized in Appendix 4.8 (see also spreadsheet "sdmi_User Comments & Open Responses_v2.xls").

Survey Respondent Comments

Following are a sampling of comments taken verbatim from the survey responses. (*these are in italic font*). These comments are from a range of technicians to managers. Authorship of the comments is intentionally left blank.

You should consider some studies to determine frequencies. there are several models out there that can be used to estimate the frequency needed to detect change. Ideally we would have annual data, do these models, then determine the frequency which may vary across the state.

We purchased $250k worth of high resolution Quickbird imagery, but the contractor has been forced to back out of much of the deal because the existing DEMS were too inaccurate to adequately georeference & orthorectify the imagery.

I think it is very important to have an accurate DEM, otherwise any imagery would be inaccurate due to it's poor orthorectification. Many of our models depend on DEM data and the current DEM is impacting our work.

We've been talking about this for years...most users want both products, but imagery is what is going to drive major development of resources, get people hooked on using it, and allow additional support for getting a DEM.

Thanks for doing the survey. Let us know if we can be part of a partnership for new/additional topography in Juneau, and possibly aerial photography. We can also use some technical assistance/brain-storming on less expensive techniques; e.g., leveraging aerial digital photos and integration with Google earth and/or visual earth. Perhaps one simple thing is to provide a mechanism for updating what is on Google earth -- both road centerlines and imagery.

A Digital Elevation Model (DEM) collection should be made the highest priority in this initiative. Positional accuracy for these products should follow published National Standards for Spatial Data Accuracy. an accurate DEM will provide the basis on which accurate ortho-imagery can be developed

Overly detailed data will be too costly to acquire over large areas, and needs to be limited to high priority urbanized areas.

For EMERGENCY MANAGEMENT/RESPONSE: ideally, high resolution (2 feet per pixel) is needed statewide, for all communities, updated annually. Update priority should be based on rate of community growth.

Our analysis of environmental change, often related to climate change, requires the availability of high-resolution base imagery and terrain models. Data such as this should be generated through coordination, and broadly shared for a broad range of analytical uses.

Strategies for success? Why should this effort not end like all of the previous ones?

1.5 Inventory of Existing Data

This effort was to inventory the existing imagery and terrain data of Alaska that is owned by, or licensed to federal, state, and local government agencies. More extensive inventory of vendor imagery and elevation data will take place in Task 2 of the SDMI Project Planning, activities will involve obtaining attributed footprint shapefiles of commercial, high-resolution imagery and terrain vendor archives. .

Existing archives of imagery was inventoried by:

- Image Dataset
- Data Type
- Map Scale / Resolution
- Geographic Coverage
- Temporal Coverage

- Data Access
- Cost / Licensing
- Shapefile/Map
- Comments

Findings of the inventory show the following:

- 78 imagery datasets identified: 16 in AlaskaMapped; local government; mix of NPS, USFWS, USGS across the state.
- 36 digital elevation datasets identified: mix of local government, north slope, Kenai Peninsula, Gulkana.

HDR worked closely with their lead sub-contractor I-Cubed Inc. to create a spreadsheet template for imagery inventory with metadata attributes, including attributes like Data Type, Resolution, Geographic Coverage, and Temporal Coverage (see Appendix 4.5). A similar spreadsheet template was created to inventory existing terrain datasets (see Appendix 4.6).

Two main approaches were used to collect the desired metadata. The first performed Internet searches for metadata pertaining to Alaska datasets. Internet sites searched in this manner include federal data access sites such as USGS Earth Explorer or USDA Farm Service Agency, and state sites such as AlaskaMapped or Alaska Geospatial Data Clearinghouse. The second approach was to directly contact key personnel in the State of Alaska, as well as respondents to the Alaska SDMI Survey who provided basic information regarding their data holdings. I-Cubed found that an initial phone interview yielded the most complete results. The phone interview was followed by an email, soliciting any missing information or thanking the interviewee for their assistance. Interviewees with a large amount of data to report were emailed the spreadsheet template to complete and return. The compiled metadata from all sources was then parsed by category into the appropriate spreadsheet. Please note, that this inventory is a living document, as there are likely other sources of digital basemap data to be discovered.

Final inventories were divided into categories: imagery – federal, state, local and non-profit; terrain – federal, state, local and non-profit. Please see Appendices 4.5a, 4.5b for summaries of imagery and terrain inventories.

2.0 CONCLUSIONS AND RECOMMENDATIONS

The user survey, interview, and public interaction activities resulted in a wealth of information regarding requirements for SDMI data, user preferences, areas of interest, existing imagery and elevation data held by users, and comments regarding the direction of SDMI. Additionally, through these efforts, a strong SDMI user and stakeholder group emerged consisting primarily of land management, natural resources management, engineering, mapping consultants, and mineral resource users spanning government, private industry, Native, and not-for-profit organizations.

The major findings from the user survey are summarized as follows:

- The survey response was strong with nearly half of those contacted investing their time to answer the 46 online survey questions. Response to the survey covered a wide range of users and agencies. 12 State agencies were represented in the survey, and 10 Federal groups (this includes military). Private industry, Native organizations, academia, and non-profit organizations also responded to the survey. Additionally, 60 respondents went beyond answering the survey and provided area of interest maps and digital shape files. Of the 152 survey respondents, many (72%) are willing to engage in follow-up activities and 88% expressed interest ("yes" or "maybe") in partnering or contributing data to SDMI.
- Basic Requirements – Digital Elevation Models (DEM): Three main requirements emerge from the user survey: a) the ability to control imagery to create ortho-photo products, (low-accuracy DEM); b) a mid-accuracy DEM for key applications, e.g. Aviation Safety Program (Terrain Avoidance Model) and land management; and c) high accuracy elevation data for low relief areas and for infrastructure mapping in inhabited areas. More research is needed to determine user's DEM requirements. In particular, the Aviation user group's needs are not well known, as little response was received from this group in the User Survey. The mean topographic contour interval sought by respondents is approximately 15 feet. Users did indicate that a refresh of the statewide elevation layer is needed to improve its accuracy and increase its resolution. Half the respondents want a minimum refresh cycle of 10 years or better for elevation data. The existing USGS DEM (NED), while still widely used, generally does not meet most users needs in terms of accuracy, consistency, and currency.
- Basic Requirements--Imagery:
  The overall need is a statewide coverage at moderate resolution, and reasonable cost that can offer a 3-5 year refresh cycle. Imagery should be capable of supporting the Use Cases identified in Section 1.2. Dynamic features (i.e. features that are constantly changing) are being mapped in each of the Use Cases, and this affirms the need for

refreshed imagery at 3—5 year cycles. More work is needed to confirm and clarify the Use Cases identified in Section 1.2. An "imagery workshop" is recommended targeting key users in each of the Use Cases.

- Community Participation is Growing: There is a high interest in sharing data, and many users have stepped forward to contribute data to the established SDMI repository. Users stated (67% of respondents) that cost is the major impediment to using digital basemap data. Sharing and pooling of funding for data acquisition is also hindered by lack of a common coordinating agency. There is a shortage of available digital public imagery and elevation data. This can be improved by expanding the shared public data pool through license uplifts in key areas, e.g. Anchorage, Kenai, Alaska Community Profiles, etc. Lack of a good quality (consistent, up to date) statewide DEM is an impediment to all users
- Technology improvements are making statewide imagery and related data easily accessible, and available to more users. Google Earth is used heavily by survey respondents. The use of web mapping services is increasing, allowing imagery and related data to be easily incorporated into GIS, e.g. GINA, Kenai Peninsula Borough, etc. These technologies offer a huge improvement in terms of making it easy to access imagery and related data via GIS and other mapping software.
- Federal Interest In Funding Appears Low: Based on the survey response, there appears to be little federal funding available for SDMI; however, interest for sharing imagery and elevation data with other users is very strong; and in general the SDMI program meets with enthusiasm as a way to better coordinate statewide data acquisition. A problem consistently expressed by survey respondents is that little to no coordination occurs at the present for new data acquisitions. Similarly, State agencies are very interested in new data collects, but are also hampered by lack of a coordinating point for pooling funds.
- Two levels of user need emerge in terms of scope: statewide and core areas. Statewide needs reflect a moderate resolution specification, whereas the core areas reflect *project* work (e.g. large resource exploration projects, infrastructure, etc.). Core areas of high interest have emerged from user response (see the AOI map in Figure 7). There is a substantial interest in statewide imagery and elevation data coverage, and highest interest in coverage in the core areas, specifically key corridors (e.g. highway/pipeline, river, utility).
- Several key use cases are identified from the user survey: land management, land cover/wetlands mapping, infrastructure (roads, pipelines, buildings) mapping, environmental analysis, and natural resource inventories. These use cases are built largely upon Federal and State agency respondents, but private and other non-government respondents have parallel uses.These use cases indicate that dynamic features are critically important in terms of mapping, i.e. users want to be able to map change in features, whether they be hydrographic, urban or rural human-built, or land cover. Thus a regular refresh of

data is important, and the survey indicates this rate is every three years.

- **The survey showed that easy access to data and documentation (metadata) is important to users.** Respondents use digital basemap frequently for general mapping, remote sensing, and 3D visualization. Hydrographic features (river features, water bodies, and related—wetlands) are the most common features mapped by respondents with existing basemap data, followed by infrastructure—roads, buildings; and then land management boundaries.
- **There appears to be a body of ground control data that respondents are willing to provide, consisting largely of photo identification points with survey control.** There is also interest in a central repository for control information. Based on previous experience, existing control is largely confined to populated areas, project sites, and transportation corridors, but locations need to be identified as a follow up activity. This topic will be explored further in Task 4 of the SDMI Project Planning.

Other survey findings and observations (see Appendixes 4.1, 4.2, and 4.7 for detail):

- Most respondents are technical users or a mix of technical and managerial, and use digital basemap data frequently for general mapping, remote sensing, and 3D visualization in that order.
- Respondents were from state agencies (35%), federal agencies (25%), the private sector (17%), local government (8%), academia (4%), utilities (3%), military (3%), not-for-profit (2%), not-for-profit Native corporations (1%), and other (2%).
- The user profiles fall into the following types (in this order): land management, environmental data collection and analysis (land cover, wetlands, other), GIS and mapping/surveying consulting, forestry, mining and earth sciences, and water resources.
- As one would expect from the demographic profile of the state, most respondents operate statewide at 42 percent, followed closely by south central Alaska at 34 percent, with interior, southeast, and north slope grouped at about 16 percent.
- Most respondents felt the most important improvement is to make digital least-cost basemap data easily available. When digital basemap data is not available, respondents use USGS maps and Google Earth as a substitute.
- There is a definite interest (23.5% said yes, 64% said maybe) in partnering with SDMI for digital data. Participation ranges from willingness to share data to providing financial support.
- When asked (Question 24) which data type would be used most frequently if available, imagery is preferred over elevation data.
- The three most important qualities respondents want in digital basemap data are spatial resolution, absolute accuracy, and metadata.

- Hydrographic features (river features, water bodies, and related—wetlands) are the most common features mapped by respondents with existing basemap data, followed by infrastructure—roads, buildings; and then land management boundaries.
- River corridors, highway and pipeline corridors, and populated places were the three specific area types desired for acquisition. South Central, Interior, and Southeast Alaska were the top three geographic regions.
- Most respondents (70%) want a minimum five year refresh rate on imagery; 46% favor refresh of three years or better. This is supported by the survey's finding of the top nine features being mapped by respondents are dynamic in nature.
- Most respondents prefer moderate resolution elevation data (1:24,000 scale equivalent—between 1/3 and 1/9 arc-second), with updates provided when changes occur or better resolution data become available. It is clear, however, that many respondents want a DEM coverage in order to properly control imagery and provide a base. More clarification of DEM needs is needed.
- Although moderate resolution imagery and elevation data are most commonly requested, more clarification is needed regarding priorities for imagery and elevation data acquisition.
- 78 imagery datasets identified in the inventory of existing datasets; and 36 digital elevation datasets identified. These are a mix of local government, National Park Service, BLM, and USFWS holdings.
- Most (72%) are willing to participate in SDMI activities and follow-up to the survey.

3.0 RELATED READINGS

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4.0 APPENDICES

4.1 SDMI Survey Questions and Responses

4.2 Profile and User Needs

4.3 Area of Interest for Acquisition Respondent List

4.4 Maps showing Respondents Area of Interests for Imagery and Elevation data

4.5 Inventory Summary of Existing Digital Imagery

4.6 Inventory Summary of Existing Terrain Data

4.7 Survey Comment and Response Summary

4.8 Full Respondent List